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EXPLAINING AND TRUSTING EXPERT EVIDENCE: WHAT IS A 'SUFFICIENTLY RELIABLE SCIENTIFIC BASIS'?

1. Introduction

The principle governing judicial scrutiny of the reliability of expert evidence in criminal trials in England and Wales is 'that in determining the issue of admissibility, the court must be satisfied that there is a sufficiently reliable scientific basis for the evidence to be admitted. If there is then the court leaves the opposing views to be tested before the jury.'¹ According to Criminal Practice Direction (CPD) 19A.4, this principle applies 'especially', but not solely, to scientific evidence and courts are 'encouraged' to consider similar factors to those which the Law Commission (2011) recommended should become statutory preconditions for admissibility. Possibly because of lack of awareness in the profession of what the CPD requires (Davies and Piasecki 2016), there is a dearth of case law on its interpretation. This article sets out a view of how it ought to be interpreted

The combination of the 'sufficient reliability' test with a reaffirmation of the jury's role as the final arbiter of the weight of evidence reflects a tension between two fundamental principles of the criminal jury trial: that defendants should be convicted only when their guilt is proved to the criminal standard on a 'logically justifiable basis';² and that it is for the jury, not any purported expert, to determine what weight can be given to any piece of evidence in deciding whether the standard of proof is met. The principle of rational fact-finding or 'epistemic due process' (Brewer 1998, Beecher-Monas 2009) can be invoked to support an 'exclusionary ethos' (Edmond and Roach 2011: 396-405), according to which only evidence that demonstrably meets rigorous standards of scientific validity (or analogous standards in non-scientific fields of expertise) can be admitted. On the other hand, the role of the jury in determining the weight of evidence according to its own lights can be to support the much criticised 'laissez-faire approach' (Law Commission, 2011: 11), which demands little more of expert evidence than that it be relevant and capable of assisting the jury. The CPD cannot plausibly be interpreted as either of these opposing views. Being anchored in existing case law, it cannot be supposed to embrace an 'exclusionary ethos' which would radically change the previously existing approach. But by incorporating as many of the Law Commission's recommendations as could be implemented without legislation, it clearly signals a rejection of the *laissez faire* approach.³

In looking for a tenable middle ground between the exclusionary and laissez-faire approaches, it is important to appreciate that the jury has different tasks and a different epistemic standpoint to that of a scientist. Whether a lay tribunal, considering the evidence as whole, can be sure of guilt is a different question from whether a particular piece of evidence, considered in isolation, conforms to some test of scientific validity. The jury performs two epistemic functions that cannot be appropriately performed either by expert witnesses themselves or by regulatory bodies that provide quality control in various fields of expertise. One is the task of putting all the evidence, expert and non-expert, together and determining whether it satisfies them to the relevant standard of proof (i.e. the criminal one, or in cases where the defendant has the onus of proving a defence, the civil one). The

¹ *R v Dlugosz* [2013] EWCA Crim 2, [2013] 1 Cr App R 32, [11]

² *R v Henderson R v Henderson* [2010] EWCA Crim 1269, [2010] 2 Cr App R 24, [2]

³ See also Leveson LJ's remarks in *R v H* [2014] EWCA Crim 1555, [44].

other is to determine on behalf of the community at large what degree of trust can be placed in the experts. As the OJ Simpson case famously demonstrated, where either the scientists themselves, or those who collect trace evidence they analyse, are viewed as untrustworthy, otherwise extremely powerful scientific evidence may fail to satisfy a jury (Lynch et al 2008: 113-20).

Because these two aspects of the weight of evidence – the explanatory inferences to be drawn from the whole body of evidence of which it forms part, and the degree to which the witness can be trusted – are matters reserved for the jury, the judge cannot determine the weight of the evidence by examining the expert evidence in isolation. What the judge can determine is, to borrow a phrase from hearsay law,⁴ whether the evidence is *potentially safely reliable*. As the Court of Appeal has explained in the hearsay context:

The critical word is ‘potentially’. The job of the judge is not to look for independent complete verification. It is to ensure that the hearsay can *safely* be held to be reliable. That means looking... at its strengths and weaknesses, at the tools available to the jury for testing it, and at its importance to the case as a whole.⁵

- (1) The judge has to consider whether in the light of other evidence that is expected to be given they jury *may* be placed in a position where they *could* rely on the evidence as part of the basis on which they convict or acquit the defendant. *Tsekiri*-type cases, where the
- (2) *Reed*-type cases, where the expert infers an activity-level proposition from a source-level one, and although the validity of the source-level evidence (that it is the product of a properly validated method, correctly applied) is not disputed, the validity of the activity-level inference (what Carr et al, 2018, call the ‘evaluative validity’ of scientific evidence) is questionable.
- (3) *Dlugosz*-type cases where the

These three different scenarios will be considered in detail in sections 4-6 below. Before that, the two following sections will address, respectively, the importance of explanatory inferences and of trust in evaluating scientific evidence.

Explanationism and potential reliability

In terms of what Allen and Pardo (2019), perhaps somewhat over-dramatically, portray as the ‘paradigm shift’ from Bayesian to explanationist approaches to evidence law,⁶ the present account is firmly on the explanationist side of the divide. That is, it assumes that the way juries assess evidence is not to consider each piece of evidence sequentially to determine how much more or less likely it makes a particular hypothesis, but rather to consider what explanatory theory best accounts for the evidence as a whole. A good explanation is, broadly, one that is coherent, plausible (given the jury’s background assumptions about the likelihood of events), and accounts for all or most of the evidence. This, according to the explanationist paradigm, is not only good descriptive account of how juries decide cases (Pennington and Hastie 1993), it is also normatively appropriate

⁴ *R v Ibrahim* [2012] EWCA Crim 837, [2012] 2 Cr App R 32, [107].

⁵ *R v Riat* [2012] EWCA Crim 1509, [2013] 1 WLR 2592 [33].

⁶ Allen and Pardo make this claim in the abstract of their (2019). The fact that they do not repeat the claim in the article itself suggests that it should not be taken too literally.

as a way of making justified knowledge-claims about past events (MacCormick 2005, Ch 11).

Explanationism is also consistent with what I take to be the most convincing account of the epistemology of testimony (in the philosophers' sense of whatever people tell each other), or at any rate the one best suited to the evaluation of formal testimony in a court of law.⁷ Believing testimony, on this account, relies on a form of inference to the best explanation (Lipton 1998, Gelfert 2010). We believe a witness's account if we can infer that the best explanation of their saying what they do is that they actually witnessed (something like) the events that they now claim to remember, or that they arrived at their scientific conclusion by the competent application of a valid scientific method. We disbelieve or doubt it if there another good explanation, for example that the witness is lying to protect a lover; or in the case of expert evidence, that the witness is mistaken, biased, or downright fraudulent.

In explanationist accounts of fact-finding the standard of proof that a party has to meet is not a threshold of mathematical probability but rather a qualitative judgment of the 'relative plausibility' of two or more explanatory theories; where the criminal standard of proof applies, 'the state must demonstrate that there is no plausible account consistent with innocence' (Allen 1991: 382). Denning J (as he then was) said something similar in *Miller v Minister of Pensions*:

If the evidence is so strong against a man as to leave only a remote possibility in his favour which can be dismissed with the sentence 'of course it is possible, but not in the least probable,' the case is proved beyond reasonable doubt, but nothing short of that will suffice.⁸

Jurors may differ in their ideas of what is plausible or realistic (because they have different experiences and assumptions about social life) and in the degree of caution they apply in deciding what can be ruled out. They may therefore differ in their assessment of whether a body of evidence has sufficient weight to meet the standard of proof.

The question whether a reasonable jury could, looking at the expert evidence in context, arrive at a position where they rule out all innocent explanations of the evidence arises in two contexts: decisions about the admissibility of the expert evidence, and about whether the defendant has a case to answer. Which test to apply may depend on whether the expert advances a strong claim, which may go beyond what is admissible, or a weaker claim that may be insufficient to raise a case to answer. For example in the recent case of *Bech*⁹ the experts instructed by the prosecution and defence agreed that the profile of the 'major contributor' to the DNA recovered from the airbag of a crashed car was one billion times more likely to be found if it came from Mr Bech than if it came from an unknown unrelated person; but they found it impossible to assess the relatively probabilities of several different

⁷ In contrast to the 'assurance view of testimony' (Moran 2018), which is most plausible in situations that are remote from the 'juridical' one where testimony has to be evaluated as evidence (McMyler 2011: 59-60).

⁸ [1947] 2 All ER 372, 373. For recent approval of this statement in a criminal law context see *R v Smith* [2012] EWCA Crim 702, [16]. Keane and McKeown (2019) draw on *Miller* to formulate a new definition of the criminal standard in terms of 'no realistic doubts'.

⁹ [2018] EWCA Crim 448.

explanations of how it got there.¹⁰ If the prosecution expert had expressed the opinion that the most probable explanation was that the DNA was there because Bech was driving at the time of the crash, there would have been an issue as to whether that inference was sufficiently reliable to be admitted (and this would have been a *Reed*-type case in our terminology). As it was, the admissibility of the agreed, cautiously worded evidence was uncontested; instead the question (in a *Tsekiri*-type case) was whether on the basis of ‘common sense’ inferences from the circumstances of the crash, the

One difficulty faced by the explanationist paradigm is to explain how (if it all) the criminal standard of proof can be satisfied in cases that largely depend on the uncorroborated evidence of one witness – whether an eyewitness or an expert. Given how poorly equipped human beings are to detect one another’s lies (Bond and DePaolo 2006, Levine 2014), deception appears to be a *possible* explanation of almost every instance of testimony, even if it is not usually the best one. Scientific fraud and misleading reports of results are by no means unknown, and a lay audience has little chance of spotting them unaided.¹¹ But juries are sometimes (though some might think not often enough, particularly in rape cases) prepared to believe the unsupported evidence of alleged victims of or experts such as the forensic scientist in *Tsekiri*. How can they rule out the possibility of deception or scientific fraud? The obvious answer is that in these cases they trust the witness’s honesty, even though they do not have specific evidence for it (except perhaps the extremely tenuous ‘evidence’ of a witness’s demeanour).

2. Trust and potential safety

What I mean by trust is an assumption that the trusted person or category of persons will behave (or has behaved) in accordance with shared social norms, including the ethical duties of their profession or occupation (Fukuyama 1995), . When there is little or no positive evidence that a person is trustworthy in these respects, trust may be a matter of giving them the benefit of the doubt, of accepting a certain risk of betrayal as part of the price of cooperative social relations. In the case of testimony it may be a matter of ‘defaulting to truth’, presuming one’s informants to be truthful until one has evidence to the contrary (Levine 2014). This can be either a passive failure to consider the possibility of deception, or ‘a fall back cognitive state after a failure to obtain sufficient affirmative evidence for deception’ (ibid: 380).

The kind of trust that does not rely on any positive evidence of trustworthiness has been extensively discussed in the recent literature on the epistemology of testimony (e.g. Faulkner 2011, McMyler 2011, Moran 2018). Without rehearsing this debate in any detail, I shall simply state my preferred view which largely follows those of Adler (2002) and Gelfert (2010, 2014) and also draws support from Levine’s (2014) work in psychology. On this view, trusting people to be truthful in most situations is a justifiable practice because experience suggests that, on the whole, it works – it allows us to acquire a lot of mostly

¹⁰ Ibid [5].

¹¹ The website <retractionwatch.com> provides many sobering examples (accessed 9 Jan 2020). Two UK forensic science providers, Randox and Trimega, have been investigated for manipulation of data: HL Deb, 27 November 2017, c518; Dearden (2018).

correct information with relatively little effort – and the best explanation for its success is that most people are, in fact, truthful most of the time. In the case of science, what best explains the overall success of the scientific enterprise that while some scientists are fraudulent, the great majority are not (Douven and Cuypers 2009). Thus, there is no inconsistency between recognising the importance of trust in testimony and regarding the acceptance of testimony as founded on a form of inference to the best explanation.

To what extent is it legitimate to bring these attitudes of trust into the courtroom? Here there is, I submit, a crucial difference between expert witnesses and others. A degree of trust in testimony is part of the general background knowledge that jurors bring to their task. Presumably jurors will vary in how trusting they are and whom they are more disposed to trust, and the jury as a whole represents a kind of rough community sample of these attitudes. The party calling a witness is not expected to adduce evidence that they are truthful: indeed they are generally precluded from doing so, unless it is to rebut evidence called by the other side (Dennis 2017: 568-9). In the case of an expert, there is similarly no need to prove that they are not fraudulent, unless fraud is alleged by the other party: that much can be taken on trust. More broadly, courts generally trust experts to comply with the duties with which they solemnly declare that they have complied,¹² and with instructions given by the judge.¹³ Breach of that trust can attract severe sanctions for contempt of court.¹⁴ The reliability of an expert's techniques or theories, however, is not a matter to be taken on trust. When the reliability of an expert's findings is an essential part of the prosecution's case, it must be something that the prosecution has to prove. It is in this respect, *pace* Schauer and Spellman (2013) that expert evidence is 'really different'.

Arguably an exception can be made for 'old-established, academically-based sciences such as medicine, geology or metallurgy, and the established professions such as architecture, quantity surveying or engineering'.¹⁵ their reliability as to some central aspects of their respective fields might be said to form part of the typical juror's background knowledge. But even in that dictum, in a judgement that is of the *laissez-faire* approach, Bingham LJ (as he then was) specifically mentioned fingerprints and handwriting as falling outside these 'core areas'.¹⁶ The need to prove the reliability of handwriting evidence is confirmed by *R v Ewing*,¹⁷ where it was held that where the prosecution relies upon a comparison between a certain document and the defendant's handwriting, the authenticity of the sample of the defendant's handwriting with which the comparison is made (which by statute has to be determined by the judge) must be proved to the criminal standard. It would be nonsensical to apply this standard to the authenticity of the handwriting but not the reliability of the comparison of the handwriting with a questioned document.

¹² *Liverpool Victoria Insurance Co Ltd v Zafar* [2019] EWCA Civ 392, [2019] 1 WLR 3833 (*sub nom* *Liverpool Victoria Insurance Co Ltd v Khan*), [23], [61], [65].

¹³ *R v Pabon* [2018] EWCA Crim 420.

¹⁴ *Liverpool Victoria Insurance Co Ltd v Zafar* [2019] EWCA Civ 392

¹⁵ *R v Robb* [1991] 93 Cr App R 161, 164, Bingham LJ.

¹⁶ *Ibid.*

¹⁷ (1983) 77 Cr App R 47.

Notoriously, this requirement has not been very strictly applied to handwriting expertise in English or US courts (Risinger and Saks 1996).¹⁸

Carr et al (2016) have proposed ‘critical trust’, a concept taken from the work of Walls et al (2004) on perceptions of health and safety regulation and applied to forensic science by the former Government Chief Scientific Adviser, Sir Mark Walport (2015), as a ‘reformative principle’ in the law of expert evidence. My interpretation of this (somewhat vague) principle is that it accepts a degree of trust in the integrity and competence of accredited experts as essential to the generally successful social practice of relying on scientific and other expertise, but insists that deference to science as reliable knowledge can be justified only by careful scrutiny of its claims. Importantly, Carr et al (2016: 367) point out that only a limited amount of this scrutiny takes place through the examination of witnesses in court. A lot of the work has to be done by regulatory bodies such as the Forensic Science Regulator, and *their* work in turn, must be subject to scrutiny, for example by parliamentary committees and academics. The object of ‘critical trust’, therefore, is neither the individual expert nor a vast abstraction called ‘Science’, but a complex system of interlocking forms of regulation and scrutiny. It is not suggested that these systems need to be explained in detail to the jury. Rather, evidence may be ‘sufficiently reliable to be admitted’ if a jury which implicitly trusted that some kind of scrutiny was in place to ensure reliability would not be mistaken in that belief.

Having outlined the epistemic significance of explanatory inferences and trust, and the relationship between them, we now turn to consider how they can be applied to the three types of cases distinguished in the Introduction.

3. *Tsekiri*-type cases: uncorroborated expert evidence

The first type of case is one where the source-level scientific evidence is the sole evidence adduced to prove (or cast doubt on) one element of the prosecution case such as the identity of the offender, the nature of a substance¹⁹ or the speed of a vehicle.²⁰ The evidence is most likely to be controversial in relation to identification, where the prosecution argues that when the scientific evidence is put together with the evidence of how, where and when the offence was committed, the only reasonable explanation for the source-level proposition supported by the scientific evidence is that the defendant committed the offence. As indicated in the above discussion of *Bech*,²¹ the issue usually arises in the context of a submission of no case to answer, rather than whether the evidence is sufficiently reliable to be admitted. In the case of prosecution evidence, the questions of whether it is ‘potentially safely reliable’ (for the purpose for which the prosecution seeks to rely on it) and whether it forms part of a case to answer, are very similar.

¹⁸ In *R v Clemo* [2014] EWCA Crim 1525, faced with a stark conflict of evidence between handwriting experts, the Court of Appeal found the conviction unsafe but gave no consideration at all to whether either expert’s evidence was sufficiently reliable to be admitted.

¹⁹ E.g. *R (Wright) v CPS* [2015] EWHC 728 (Admin), where extremely poor-quality expert evidence of drug possession was ruled insufficiently reliable to be admitted.

²⁰ Expert evidence is not normally required where a speed measuring device is used, but is essential where the reliability of the device is challenged: *R (DPP) v Manchester and Salford Magistrates’ Court* [2017] EWHC 3719 (Admin), [2019] 1 WLR 2617.

²¹ See text to n 9 above.

To meet the case to answer threshold, it must be possible for a reasonable jury to rule out all realistic possibilities consistent with innocence.²² This entails that the prosecution must make the jury sure that the method used to identify the defendant was valid, highly accurate and correctly applied. The only forensic identification methods likely reach that standard are the more straightforward applications DNA analysis and fingerprinting (PCAST 2017). In *Hookway*²³ and *Weighman*,²⁴ however, so-called ‘facial mapping’ evidence (identifying similarities between the defendant’s face and an image from a security camera) has been treated as sufficient to establish identity, and these cases have been treated as important precedents in the case law on DNA evidence. Yet it is quite plain that facial mapping of the type used in these cases was not a technique that had been validated and even if it is valid, it was incapable in isolation of establishing identity to a level of probability that came anywhere near the criminal standard of proof (Edmond et al 2010).

As Redmayne (2002) argued in a commentary on *Hookway*, the only reasonable explanation for the decision is that the jury must have assumed the police had intelligence pointing to Hookway as a possible offender, otherwise his photograph would not have been submitted to the expert. In other words, they must have treated the case as if it were a *Dlugosz*-type case in which the scientific evidence could be inaccurate, but if so it would be remarkable coincidence that it identified a person who was incriminated by other evidence. But no such evidence was before the court. Therefore *Hookway*, and the later case of *Weighman*, contravene the elementary principle that the evidence adduced in court must prove to the criminal standard that the defendant is guilty. In these cases it is all too clear that the Court of Appeal’s respect for the jury’s role as arbiter of weight has trumped the competing principle that convictions must have a rational basis.

*R v Tsekiri*²⁵ itself concerned a robbery from a car, in the course of which the robber had placed his hand on the door-handle. Tsekiri, who lived in a nearby district of London, matched the ‘major contributor’ to a DNA profile obtained from the door handle. The Forensic Science Regulator’s (2018) Guidance on DNA mixture interpretation expresses caution about identifying ‘major’ and ‘minor’ contributors to mixed profiles, but accepts that it ‘may be supportable for a mixture where there is a clear unambiguous single strong profile at every locus, assigned without reference to the profile of the POI [person of interest]’ (para 2.9.11). The judgment says very little about how the mixed sample was analysed to determine which DNA alleles belonged to the major contributor, or how the jury could be sure that this process was free from error. As Karen Richmond points out in a valuable note on the case, the ‘deconvolution’ of mixed samples can involve a combination of professional expertise and complex computer algorithms. Any software that was used should have been validated as appropriate for particular types of DNA mixture (Royal Society and Royal Society of Edinburgh 2017a: 34-5) but the *Tsekiri* judgement tells us nothing about this. The random match probability of 1:1 billion (the level at which reported match probabilities are ‘capped’ in the UK) tells us nothing about the probability that the defendant matched a profile in which one or more loci in fact came

²² *R v G and F* [2012] EWCA Crim 1756 [36].

²³ [1999] Crim LR 750.

²⁴ [2011] EWCA Crim 2826.

²⁵ [2017] EWCA Crim 40, [2017] 1 WLR 2879

from the unknown minor contributor(s). There is no mention in *Tsekiri* of whether any expert examined the sample on behalf of the defence.

The most problematic aspect of *Tsekiri*, however, is the inference from the source-level finding to the activity-level proposition that the defendant was in contact with the door handle. The scientist acknowledged that ‘the deposit of the major contributor could have been ... due to secondary transfer though she considered secondary transfer was unlikely given that the DNA in question was the major contributor to the profile.’²⁶ On the face it, this falls short of entitling the jury to be sure that secondary transfer was not the explanation of the profile. As Richmond (2017: 277) points out, research indicates that it is quite possible for someone to become the major contributor to DNA on an object through secondary transfer – for example if the robber had shaken hands with Tsekiri shortly before the incident (see Murphy 2015, Ch 3; Cale et al 2016). Since there was no dispute that the robber did touch the door handle,²⁷ the Court was entitled to conclude that the best explanation of the DNA deposit was that it was Tsekiri’s DNA and Tsekiri was the offender. That would suffice to establish liability to the civil standard, but it is not so clear that all innocent explanations of the evidence could be ruled out.

It is significant that *Tsekiri* turned on whether the trial judge was right to rule that there was a case to answer, rather than on whether the eventual verdict was safe. Where a defendant makes no comment in interview and does not advance a positive case at trial, but simply puts the prosecution to proof, no adverse inference can be drawn under the Criminal Justice and Public Order Act 1994, s 34, because the defendant has not relied on any fact in his defence.²⁸ Once the judge has ruled that there is a case to answer, the defendant faces a dilemma. If, as Tsekiri did, he elects not to give evidence, the jury can draw an adverse inference under s 35 of the same Act.²⁹ If he does give evidence after giving a ‘no comment’ interview, he will find it hard to avoid relying on some ‘fact’ which he did not mention to the police,³⁰ thereby triggering an adverse inference under s 34. Since the Court of Appeal was satisfied that the s 35 inference together with the DNA evidence rendered the conviction safe, the Court was understandably reluctant to declare it unsafe on the ground that without the s 35 inference there was no case to answer.

Even if Tsekiri’s silence could not form the basis of an adverse inference at this stage, could it be said that in the absence of a specific alternative explanation of the DNA on the door-handle, the prosecution theory was only explanation the jury need consider? The Court reasoned:

If a defendant in interview gives an apparently plausible account of the presence of his DNA profile, that might indicate that the prosecution had not raised a case to answer. ... [But] the absence of explanation in such a case would mean that there would be no material to undermine the conclusion to be drawn from the DNA evidence.³¹

²⁶ *Ibid*, [3].

²⁷ *Ibid*, [16].

²⁸ *Webber* [2004] UKHL 1; [2004] 1 WLR 40

²⁹ *Tsekiri* [2017] EWCA Crim 40, [23]

³⁰ On the meaning of ‘fact’ in this context see *R v Lewis* [2018] EWCA Crim 1101.

³¹ *Tsekiri* [15]

In effect, the Court is suggesting that trust in the scientist's conclusion is the default position, which the jury is entitled to adopt in the absence of evidence to the contrary. But this is to shift the burden onto the defence in a dangerous way (Edmond 2013). The fact that a suspect does not suggest a specific explanation – which would take considerable presence of mind unless the suspect was forensically aware³² – cannot make it safe to disregard the possibility of an unknown means of secondary transfer. In any case, the expert was able to go no further than to say that secondary transfer was possible, but unlikely. The fact that an expert witness cannot rule out an innocent explanation as a matter of scientific certainty does not preclude the finding of a case to answer *where there is other evidence on which the jury can rely*.³³ In the absence of such evidence, the scientific evidence on transfer must be both unequivocal and clearly valid. In the present state of knowledge that is a formidable hurdle in a case like *Tsekiri*, or the more recent case of *Bech*,³⁴ where the Court of Appeal's conclusion that 'common sense' sufficed to rule out possibilities which the scientists were unable to evaluate is, to put it charitably, a questionable one (Richmond 2019).

The conclusion to which this analysis drives us, that the submission of 'no case to answer' ought to have succeeded in both *Tsekiri* and *Bech*, is not an attractive one. There surely was a 'case to answer' in the sense of a set of facts that called for an explanation from the accused,³⁵ even if (in *Tsekiri*) it was only 'I can't understand it – as far as I know I've never seen the car in question, let alone touched the door-handle'. The problem is that the *Galbraith* test,³⁶ which predates the modern law on inferences from silence, precludes an evaluation of the expert evidence in its full context, including the adverse inferences that they jury might be entitled to draw. Although the issue is beyond the scope of this article, there is surely a case for saying that a 'case to answer' should not be one on which a jury could convict without more, but a case on which the defendant could be convicted if they failed to answer it, or answered it in a way that exposed them to adverse inferences.

Whilst I submit that *Tsekiri* was wrongly decided on its facts, or else decided on the wrong ground, this is not to dispute that DNA found on the person of a victim or on an object at the crime scene can in some cases be sufficient to raise a case to answer. For example in *FNC*,³⁷ where the DNA came from semen left on the victim's trousers, the court was in a much better position to be sure of the source of the DNA, because it was reasonable to conclude (if contamination could be excluded) that the only plausible explanation was provided by the victim's account of a sexual assault.

In such a case what the jury needs is an explanation of the science of DNA, the chain of custody of the sample and the procedures followed in the laboratory, sufficient to persuade them (if they trust the scientist not to mislead them) that the possibilities of error, contamination or a random match are sufficiently remote to be disregarded in the absence of other evidence casting doubt on the defendant's presence at the scene. The trial of

³² As in, for example, *R v Sampson and Kelly* [2014] EWCA Crim 1968.

³³ *R v Bracewell* (1979) 68 Cr App R 4; *R Gian and Mohd-Yussuf* [2009] EWCA Crim 2553.

³⁴ [2018] EWCA Crim 338

³⁵ *Condon v UK* (2001) 31 EHRR 1, [56].

³⁶ *R v Galbraith* [1981] 1 WLR 1809.

³⁷ [2015] EWCA Crim 1732,

Stephen Lawrence's murderers is a well-known instance where the possibilities of contamination were considered at length (Evans 2012).³⁸

In many trials the explanation of the scientific evidence is likely to be brief. One DNA expert interviewed by Salavacci (2014: 175) said that a general 'explanation of the DNA process' typically took 'one or two minutes', although this was not enough for jurors to understand the more difficult points about possibilities of transfer; another thought that while 'huge amounts of technical detail' were unnecessary, 'a little lecture' with visual aids could be helpful. Such a short presentation may suffice if the jury has a high level of trust in the scientist to summarise the state of the science correctly, and in the defence to challenge any statement that is controversial.

The risk inherent in trusting such evidence is that the experts will 'avoid the academic disclaimers' and present only those aspects of current scientific thinking that favour the party calling them (Kaye 2010: 250). If the experts comply strictly with the Criminal Practice Direction they will state any necessary qualification to their evidence and explain where their opinion lies in relation to the range of opinion in their field;³⁹ but it is unclear how these obligations are interpreted or enforced. For example if the 'range of opinion in the field' of forensic podiatry were limited to the opinions of forensic podiatrists,⁴⁰ the 'extremely limited' nature of the scientific evidence behind his 'science' – fortunately summarised in one of the two 'primers' on forensic science so far issued for use in the courts (Royal Society and Royal Society of Edinburgh 2017b:7) – might well be concealed.

It would be highly desirable to ensure that in all *Tsekiri*-type cases there was independent evidence available to the court as well as the evidence of the Crown scientist. This could be from a court-appointed expert, as proposed by the Law Commission (2011), or a defence-instructed expert whose report the defence should be required to disclose.⁴¹ Ideally, guilty pleas in such cases should not be accepted unless the defendant had been offered an independent evaluation of the scientific evidence.

4. *Reed*-type cases – explanatory inferences by experts

To borrow the useful terminology proposed by Carr et al (2018), the issue in *Reed*-type cases is one of 'evaluative validity', that is the validity of inferences from source-level to activity-level propositions. As Carr et al point out, the debate about the scientific validity of forensic techniques (e.g. PCAST 2016, Ward et al 2017) has focussed on their 'foundational validity' – the ability of the method to give consistent and accurate results – and 'validity as applied', the appropriate application of the method to the case at hand; the crucial issue of evaluative validity has been largely neglected.

Problems of evaluative validity arise in many kinds of expert evidence. They are pervasive in forensic pathology, where it is not usually questioned that medical experts can accurately record the lesions and symptoms to be found in a dead body, but inferences from these to the events that caused them may be much more problematic – and for

³⁸ The issue was also discussed at length by the Court of Appeal in deciding to order a new trial: *R v Dobson* [2011] EWCA Crim 1255, [2011] 1 WLR 3320.

³⁹ Crim PR 19.4 (f), (g); CPD 19A.5(8) 19B.1.

⁴⁰ As the Court of Appeal did in *R v Otway* [2011] EWCA Crim 3.

⁴¹ Currently there is no such requirement in criminal cases (Stockdale 2018: 222).

obvious ethical reasons are difficult to test systematically (Wilson et al 2018). The ‘shaken baby’ cases⁴² are *Reed*-type cases: there was little doubt that doctors could reliably identify the symptoms known as the ‘triad’, but whether it could be inferred that the only plausible explanation of those symptoms was violent shaking was, and is, much more controversial (Lynøe et al 2017). Similar problems arise with psychiatric evidence, for example in diminished responsibility cases, except that here it is the clinical symptoms that are taken to explain the events, rather than the other way round.⁴³ In forensic science generally, a pervasive problem is how the ‘reconstruction’ of events on the basis of trace evidence can be put on a scientific footing. (Morgan 2017). In the case of DNA evidence the problem is especially acute because of the gap between the ability to construct DNA profiles from infinitesimal amounts of cellular material and the much more limited base of scientific knowledge of how DNA is transferred and retained (Gill 2014, Murphy 2015).

As Lynch et al (2008: 191) argue, ‘DNA evidence is meaningful only when it is embedded in stories that mention other evidence, possible suspects, and how the evidence itself was handled and interpreted’. This is true even in cases like *Tsekiri*, where the evidence is embedded in a story of how the robber grabbed the door handle of his victim’s car, how the DNA swab was collected and analysed, and why Tsekiri remained silent in interview and at court. In *Reed*-type cases, the surrounding story is more elaborate and can be challenged in a way that does not impugn the integrity or competence of the expert or others who have handled the evidence. Consequently the assessment of the evidence is less concerned with questions of trust, and more with holistic common-sense evaluation of different stories. The legal problems in these cases revolve around how far experts can contribute to the assessment of the overall story by drawing activity-level inferences from their source-level findings, and when such inferences improperly invade the province of the jury.

In the case of *Reed and Reed* itself,⁴⁴ the Reed brothers were implicated by a combination of DNA and circumstantial evidence in the murder of Peter Hoe. The forensic evidence was low copy number (LCN) profiling of traces of unidentified cellular material on two pieces of plastic which were alleged to be fragments of knife handles. Initially the appellants sought to challenge the validity of the LCN process, but this aspect of the appeal was abandoned. The only live issue about the DNA evidence concerned the admissibility of prosecution expert’s evaluation of the possibilities of transfer. The Court of Appeal held that most of this evidence was admissible, but the expert should not have expressed the opinion that the appellants were handling the knives when they broke. This was beyond her expertise and lacked any reliable scientific basis.⁴⁵ While upholding the admissibility of evidence evaluating the possibility of transfer, the Court also stressed the need for strict control by the judge over the terms in which such evidence was to be given.⁴⁶

⁴² *R v Harris* [2005] EWCA Crim 1980, [2006] 1 Cr App R 5; *R v Henderson* [2010] EWCA Crim 1269, [2010] 2 Cr App R 24.

⁴³ E.g. *R v Golds* [2016] UKSC 61, [2016] 1 WLR 5231.

⁴⁴ *R v Reed and Reed*, *R v Garmson* [2009] EWCA Crim 2698, [2010] 1 Cr App R 23. The *Garmson* appeal was, in our terminology, a ‘*Dlugosz*-type case’.

⁴⁵ *Reed*

⁴⁶ *Ibid* [122], [131], [133]. See also *R v Henderson*

In cases like *Reed* the jury's decision does not depend simply on how far they trust, and therefore defer to, the experts. Rather, their task is to integrate the scientific evidence with evidence of other kinds. In *Reed* there was evidence of motive, opportunity, and what the prosecution interpreted as an attempt to conceal the involvement of one of the brothers; the defence adduced alibi evidence.⁴⁷ In such a case the role of the expert is to help the jury to see how the scientific evidence can be integrated with other evidence, but not to perform the task of integration herself.

In this respect, the Case Assessment and Interpretation approach (Cook et al 1998) is helpful. It encourages experts to focus on the question of how far the scientific evidence supports or undermines each of two competing hypotheses, but *not* to advance any view as to the prior or posterior probability of either hypothesis – i.e. how probable it is given the other evidence, or the other evidence and the scientific evidence combined. *A fortiori*, it is not the expert's role to advance any view as to the coherence or plausibility of the narratives in which the opposing hypotheses are embedded. In this respect, the expert in *Reed* overstepped the mark in more ways than were noticed by the Court of Appeal.

The leading authority for the principle that experts should not interpret evidence that jurors can interpret for themselves is *Turner*.⁴⁸ If we define the three levels of the hierarchy of propositions in a way that is not limited to trace evidence, we can see that *Turner* itself was a *Reed*-type case. That is, it concerned the validity of an inference from the expert's observation and classification of certain phenomena (Turner's interview responses and other evidence of his psychological make-up) to a proposition about the events that were the subject of the trial (his murder – or manslaughter under provocation – of his unfaithful girlfriend). The defence psychiatrist inferred from his observations that Turner had a certain 'personality structure'.⁴⁹ The validity of this classification was not questioned by the Court of Appeal, though no doubt it could have been (Redmayne 2001: 147). The witness stated that this 'structure' was consistent with Turner's account of having killed his fiancée 'in an explosive release of blind rage'.⁵⁰ While accepting that the psychiatrist's evidence was relevant to this explanation, Lawton LJ pointed out that the evidence supporting the 'blind rage' theory came primarily from Turner's own evidence, coupled with background knowledge of male reactions to female infidelity. The expert evidence was inadmissible because it would unduly complicate the jury's task of assessing the plausibility of Turner's evidence, and because it might be given undue weight on account of the psychiatrist's expertise:

In such a case if [expert opinion] is given dressed up in scientific jargon *it may make judgment more difficult*. The fact that an expert witness has impressive scientific qualifications does not by that fact alone make his opinion on matters of human nature and behaviour within the limits of normality any more helpful than that of the jurors themselves; but *there is a danger that they may think it does*.⁵¹

⁴⁷ Ibid (*Reed*) [13]

⁴⁸ [1975] QB 834.

⁴⁹ Ibid, 839.

⁵⁰ *Turner*, 839.

⁵¹ Ibid, 841, emphasis added.

An additional reason, not explicitly stated, might have been that it would divert the jury from the ‘offence-level’ question of whether Turner’s reaction was that of a ‘reasonable man’ (Redmayne 2001: 149-54). The broad principle to be extracted from *Turner* is, I suggest, that relevant evidence adduced either by the prosecution or the defence may be excluded on the grounds of its tendency unduly to complicate the jury’s task, or to lead to undue deference on the jury’s part.

While not referring directly to *Turner*, the *Reed* court was alert to the danger that the expert’s evidence would be ‘tainted with the verisimilitude of scientific certainty’.⁵² What it appeared to overlook was how the expert strayed into the jury’s province of making common-sense assessments of the plausibility of narratives – something that she appears to have been allowed to do because she was experienced in examining scenes of crime and had examined the scene of the murder.⁵³ Thus she expressed the view that the ‘knives were foreign to the scene (as the handles did not match any in Peter Hoe’s kitchen)’;⁵⁴ that it would ‘too much of a coincidence’ for each of the Reed brothers to have touched different knives which were then brought to Hoe’s house by a third person, or for Hoe to have touched the knives shortly after shaking hands with the defendants;⁵⁵ and that for the DNA to have come from saliva ‘would have required the fortuity of saliva from two individuals landing on separate knife handles’.⁵⁶ There is no indication that the scientist possessed expert knowledge about patterns of knife ownership which would justify her assumption that any knives in Hoe’s possession would have matching handles, nor is there any indication that she drew on any scientific research about the distribution of saliva.⁵⁷ The points about the knives being ‘foreign’ and the hypotheses about secondary transfer resting on unlikely coincidences were therefore matters for the jury rather than the expert.

The more appropriate course for an expert to take is illustrated by the agreed evidence in *Bech*,⁵⁸ which simply stated that it was not possible scientifically to evaluate the likelihood of various mechanisms of transfer. This left the jury to draw ‘common sense’ inferences about whether the alternative hypotheses could be ruled out. Unfortunately both the trial judge and the Court of Appeal in *Bech* appear to have considered only whether alternative mechanisms of transfer *by direct contact* could be ruled out, and to have overlooked two other possibilities mentioned by the experts (saliva deposited while talking, and DNA being transferred to the airbag where it was found from the driver’s seat). (See Richmond 2019.)

Other aspects of the expert evidence in *Reed*, however, were matters of science on which the Court of Appeal considered that scientific knowledge was ‘plainly incomplete’.⁵⁹ For example:

⁵² *Reed* [2009] EWCA Crim 2698 [121].

⁵³ *Ibid*, [81-2]

⁵⁴ *Ibid*, [87 (iv)]

⁵⁵ *Ibid*, [89]. Hoe and one of the defendants were observed shaking hands some two weeks before the murder (Lightfoot 2013).

⁵⁶ *Ibid*, [90].

⁵⁷ For one study that might have been relevant see Port et al (2006). As far as I can discover, consistency of design among a household’s stock of knives is a subject that has eluded scientific inquiry.

⁵⁸ [2018] EWCA Crim 448, [5].

⁵⁹ *Reed* [119]

There would have had to have been ‘substantial contact’ between David and Terence Reed and those other persons and those other persons would have had to have been in contact with the knives ‘pretty quickly’ for the cellular material from David and Terence Reed to have got on to the knives. The profiles were so dominant that the cellular material could not have been on the knives for months.

... [T]he fact that there were full profiles would tend to preclude the DNA having been there for any length of time as it would have degraded far more than it had, as some degradation is always to be expected where unidentified cellular material is deposited.⁶⁰

These are the kind of background generalizations that are needed in order to evaluate alternative explanatory stories. As the jurors cannot make such generalizations on the basis of their own experience or ‘common sense’, there is little alternative to relying on the experience of the experts. trust the expert to give an honest and impartial interpretation of her experience rather than favouring generalizations that support her own explanatory theory.

the Court of Appeal important that they should not be left with the impression that it carried the same degree of scientific authority as the interpretation of the DNA profile itself. For this reason,

the court [must] exercise a firm degree of control over the admissibility of this type of evidence.... The evidence on the possibilities and the evaluation must be clearly set out in full in the terms in which it is to be given.⁶¹

While *Reed* is one the cases, along with *Dlugosz*, that established a common-law basis for the ‘sufficiently reliable scientific basis’ test, it also makes clear that the test is not a very demanding one where evidence of transfer possibilities are concerned. It is sufficient that the evidence has *some* basis in properly conducted scientific research and the witness’s professional experience, and will be helpful to the jury in evaluating the prosecution case.

At least in the present state of knowledge, this relatively relaxed standard of evaluative validity seems inevitable if DNA is to be used at all in cases where there is any dispute . Even with much more research, it is difficult to believe that it will ever be possible to evaluate the possibilities of transfer with any precision in a case like *Reed*. For example, suppose it is suggested that minute quantities of a suspect’s saliva were distributed around a room while he was speaking. There could be an almost infinite number of sub-hypotheses about where he was standing, his propensity to emit saliva while speaking, the position of the objects on which his DNA was later found, etc. The most that could be expected, even given more research, would be a vague indication of whether such a hypothesis was likely or unlikely.

A relaxed standard of ‘sufficient reliability’ does not, however, seem too outrageous when all we are considering is background generalizations that can be used to assess the plausibility of competing stories. Juries must constantly apply such generalizations and rarely do they have any scientific basis. If the jury cannot rely on experience-based

⁶⁰ Ibid [89].

⁶¹ Ibid [122]

generalizations of their own, why can they not rely on generalizations formed by people who do have relevant experience (if they trust those people to represent their experience fairly)? In this context, the Court's view that the scientist's experience-based evidence was 'sufficiently reliable to be admitted' but needed to be clearly distinguished from her scientific findings, makes sense. It is understandable that the Court preferred this solution to excluding the DNA evidence altogether, or leaving the jury to make of it what they could on the basis of 'common sense'.

5. *Dlugosz*-type cases: unvalidated but corroborated evidence

*R v Dlugosz*⁶² is the authority cited in CPD 19A for the 'sufficiently reliable scientific basis' test being part of the common law. It was a conjoined hearing Court of Appeal of three appeals from different trials where alleles matching the defendant were found in a mixed, low-template DNA profile. In two cases the Crown expert gave evidence on the lines that although it was not possible to quantify the probability that the defendant was the contributor, the results were of a nature that the expert would expect to see if the defendant was a contributor and, on the basis of his or her experience, would consider unusual if the defendant had not contributed. In the third case, *Pickering*, where there had undoubtedly been some contact between the defendant and complainant, the evidence was that DNA which could have been Pickering's was found in places which, if it was his DNA, were more consistent with the complainant's story than his.

Many of the best-known and most controversial cases in the law of expert evidence resemble *Dlugosz* in that expert evidence of weak or unknown probative value is adduced as one part of a body of evidence which taken together is arguably compelling.⁶³ Typically in these cases the evidence identifies certain features of the source material: for example, certain alleles in a DNA trace which correspond to those of the defendant's profile, or the shapes of certain parts of an image of a face.⁶⁴ The available body of scientific knowledge does not, however, allow a precise statement of how many people are likely to share this combination of features. To fill this gap, the jury is invited to infer that because there is other evidence that the defendant acted in a way that could have caused the relevant trace evidence to exist, it is highly probable that the source of the trace evidence is the defendant. In other words, rather than the activity-level proposition being inferred from the source-level proposition as in *Reed*, in a *Dlugosz*-type case the source-level and activity-level propositions are treated as mutually corroborative.

Cases like this are analogous to *Tsekiri*-type cases in one way and to *Reed*-type cases in another. As in *Tsekiri*, the issues concern the foundational validity of the scientific evidence and whether it was validly applied to the case at hand. Since it is reasonable to expect that scientific evidence should meet rigorous standards of validity in these respects, this suggests that the kind of evidence adduced in *Dlugosz* should be regarded as no more than

⁶² [2009] EWCA Crim 2698; [2010] 1 Cr App R 23

⁶³ E.g. *R v Robb* [1991] 93 Cr App R 161; *R v Dallagher* [2003] 1 Cr App R 12; *R v Luttrell* [2004] 2 Cr App R 31 (see [38] for discussion of how other evidence can support or undermine the reliability of lip-reading evidence); *R v Kai-Whitewind* [2005] EWCA Crim 1092; *R v Atkins* [2009] EWCA Crim 1876, [2010] 1 Cr App R 8.

⁶⁴ It would make sense to call these sub-source level findings but for the fact that this term is used in a difference sense by forensic scientists, to refer for example to a DNA profile that cannot be assigned to a specific bodily fluid (e.g. Taroni et al 2013: 468; Gill 2014).

untested hypotheses, unfit to be admitted (Gill 2014). The analogy with *Reed*, on the other hand, is that the scientific evidence is one piece of a ‘jigsaw’⁶⁵ which the jury can assess in a holistic fashion, considering whether the alleged actions of the defendant constitute the only reasonable explanation for the pattern of incriminating evidence. This suggests that the scientific basis of the evidence may be sufficiently reliable when considered in context, even if it would not pass the test in isolation. This argument seems particularly pertinent in the case of Kuba Dlugosz himself, who was convicted of the manslaughter of an elderly householder who had been tied up during a burglary. Dlugosz was initially identified as a suspect through a database search.⁶⁶ As Gill (2014: loc 3269) points out, this would be a dangerous basis for a prosecution if it were the sole or main evidence against a suspect, i.e. in anything approaching a *Tsekiri*-type case. The facts of *Dlugosz*, however, were significantly different from those of *Tsekiri*. Dlugosz had committed previous burglaries in which the occupier of the premises was tied up, and also made incriminating remarks in telephone calls from prison which were recorded by the authorities. In these circumstances it seems reasonable to treat the DNA evidence as analogous to an eyewitness identification made in poor conditions – not to be relied upon if it stood alone, but of significant probative value in the context of the other evidence.

The difficulty with this argument is how weak the non-scientific evidence can be before a *Dlugosz*-type case becomes a *Tsekiri*-type case, where the DNA evidence is so decisive that anything short of rigorously demonstrated scientific validity would be unacceptable. There are indications in the *Dlugosz* judgment that the Court of Appeal saw the case as quite close to the borderline. Without the DNA evidence, the character evidence could not have been admitted.⁶⁷ The defence argued that as the DNA evidence was weak, the character evidence was being used to ‘bolster a weak case’ and therefore ought to have been excluded following the guidance in *Hanson*.⁶⁸ The Court of Appeal concluded that taking the DNA evidence and the recorded telephone evidence together, there was sufficient evidence to justify admitting the previous convictions.⁶⁹ This suggests that had Dlugosz not been so indiscreet in talking on a prison telephone, the case against him might have collapsed.

Dlugosz appears, then, to be consistent with a fairly cautious approach to cases of this type, at least where the non-scientific evidence largely relates to bad character. That there is good reason to be cautious is indicated by the research that Gill and colleagues carried out to check the assumptions made in *Dlugosz*. They showed that with a low-template, mixed sample of the type analysed in *Dlugosz*, it is quite likely that a random person in the database will match 20 alleles, while the true contributor, even if on the database, may match fewer alleles as result of allele ‘drop-out’ (Gill 2014: loc 3287-3309). People on the database will tend to have previous convictions, and it would not be surprising if some of those showed a propensity for, say, burglary. The danger, as Gill (2014: loc 3629) remarks, is that ‘confirmation bias’ will lead a ‘naïve investigator’ to select the person found on the database for prosecution without looking for exculpatory evidence.

⁶⁵ Bracewell J’s oft-quoted metaphor in *Re A (a minor) (Retinal Haemorrhages: Non-accidental injury)* [2001] 3 FCR 262, [10].

⁶⁶ *Dlugosz* [2009] EWCA Crim 2698 [35].

⁶⁷ *Dlugosz* [39].

⁶⁸ *Hanson* [2005] 2 Cr App R 21, cited in *Dlugosz*, [56].

⁶⁹ *Ibid* (*Dlugosz*) [60].

There is another reason for caution in admitting the type of evidence given in *Dlugosz*. For the jury to accept the scientist's interpretation they have to trust her to draw honest and objective conclusions from her experience, and there is reason to think that the evidence in *Dlugosz* itself was subtly (and we may presume, unconsciously) biased towards the prosecution in at least two respects. One concerned the scientist's evidence that 'she had not seen all 20 of the components of an individual's profile represented in a mixed profile when it was believed that the individual had no association with the item from which the profile was obtained'⁷⁰ – which prompts the question 'believed by whom?' If it means 'believed by the police' there is an obvious risk of their too readily believing that those who match the profile are associated with the offence.⁷¹ The second objection is pointed out in the Forensic Science Regulator's Guidance (2018). To put the point simply, it is that while the probability of matching all 20 alleles to a random person may be , so is the probability of finding all 20 alleles of the perpetrator in a very small mixed profile. To point out only the rarity of the former is therefore prejudicial (ibid para 4.2.2). On this ground the Regulator recommends that the type of evidence accepted in *Dlugosz*, *Thomas*⁷² and *Walsh*⁷³ should no longer be given (ibid para 7.2.2, Guideline 12).f in a future case the prosecution were to rely on the same kind of evidence that was admitted in *Dlugosz*, the judge should pay heed not just to the result of *Dlugosz* but to paragraph 27 of the judgement, which states that where there is a 'danger...that a jury might attach a false or misleading significance to the evidence', the evidence, even if it has a sufficiently reliable scientific basis to be admitted, should be excluded under the Police and Criminal Evidence Act 1984, s 78. In light of the Regulator's guidance it is clear that the way the evidence was expressed in *Dlugosz* created just such a danger; but if the court follows the guidance in *Reed* to scrutinize and control the terms in which the evidence is to be given, recourse to s 78 can probably be avoided. Although s 78 applies only to prosecution evidence, it is clear from *Turner* that defence evidence which risks confusing or misleading the jury can be excluded at common law.

Potential reliability and the exclusionary ethos cannot be expected, unaided, to notice the particular ways in which the expert's necessarily simplified account of the science (e.g. counting the number of alleles) unduly favours one party. For this they are dependent on forms of 'quality control' (Kaye 2010: 259) such as that provided by the Regulator. This reflects a general feature of the 'epistemic division of labour' in a complex society (Goldberg 2011). Non-experts depend upon expert individuals and bodies of various kinds to monitor the testimony of other experts and weed out or warn against the testimony of (purported) experts who are unreliable. This means that non-experts do not have to place blind trust in individual experts: rather, their trust is placed in a complex system by which experts monitor one another. If this system is dysfunctional – if, for example, scientific views are monitored for ideological purity rather than scientific rigour – the results can be disastrous.⁷⁴ Something of this dysfunctionality can be seen in some US states' regulation of forensic science (Murphy 2015: 57-73).

⁷⁰ Ibid [21(iii)]

⁷¹ For a similar point see Gill (2014: loc 3210).

⁷² [2011] EWCA Crim 1295.

⁷³ [2011] NICC 32.

⁷⁴ The classic example is Lysenkoism in Soviet biology and agriculture (Gordin 2012, Ch 3).

What this means in practical terms is that judges and lawyers need to keep abreast, not necessarily of any body of scientific literature, but of the work of key epistemic ‘monitors’ such as the National Academies of Science in the US and the Forensic Science Regulator in the UK – and, if possible, to be informed of any cogent criticisms of those bodies’ work. So, for example, Conclusion

The combined effect of the common law test – i.e. *Turner* with the explicit focus on reliability added by *Dlugosz* and *Reed* – along with s 78 and the Crim PD is, perhaps unsurprisingly, not unlike that of the statutory test originally proposed by the Law Commission. A key feature of the Law Commission proposal was it took into account both the scientific basis and the ‘strength’ of the expert’s opinion – how strongly it was expressed and how strongly it would *have* to be expressed in order to be capable of affecting the verdict, given the other evidence in the case.

This kind of contextualized approach to the admissibility of expert evidence, which parallels the ‘potentially safely reliable test’ for hearsay evidence, is in my view preferable to either a ‘laissez faire’ approach or a hard-line ‘exclusionary ethos’. The dangers of the ‘laissez-faire’ approach can be summed up as the ‘lure of the obvious explanation’ and the ‘temptation of blind trust’. In cases like *Bech* and *Reed* there is an explanation for DNA trace evidence that neatly fits the prosecution’s theory of the case – but is there a rational basis on which the jury can be sure that it is the *only* plausible explanation? The temptation to trust the expert excessively – that is to a degree that spares the prosecution the need to prove an essential element of its case – arises from the reason we generally trust experts: to make our cognitive lives easier and our decisions less time-consuming (Mieg 2001). If we hand crucial decisions over to unpaid, unqualified conscripts, the temptation for them to pass the buck to the experts is potentially strong. It is perhaps surprising that juries emerge from the limited empirical work available with as much credit as they do (Freckelton et al 2016, Ch 5).

In an explanationist approach to expert evidence, the probative value of the evidence depends both on the best explanation of how the evidence came to be given (as a result of competent application of a properly validated technique, or by some more questionable route) and what the expert evidence contributes to an explanatory theory of the case as a whole. In the case of prosecution evidence, and especially where expert evidence is the mainstay of the prosecution, the experts must do all that is reasonably practicable to rule out possibilities such as contamination and the misleading presentation of results. The possibility of fraudulent, incompetent or misleading evidence cannot be completely eliminated, so to a certain extent expert evidence has to be taken on trust – a trust which is easier to justify where it is backed up by effective regulatory oversight. Trust must, however, be kept within strict limits lest it undermine the presumption of innocence.

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